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FIRST QUARTERLY STATUS REPORT

Period 14 July 1964 - 31 October 1964

UNPUBLISHED PRELIMINARY DATA

MODIFICATION OF 82-INCH COUDE SPECTROGRAPH AT McDONALD OBSERVATORY

Contract NASR-230

Harlan J. Smith, Department of Astronomy

The University of Texas

Austin, Texas

RECEIVED

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The goal of this project is to convert the 82-inch telescope's peccable stellar coude spectrograph of medium dispersion into a considerably improved coude spectrograph of high dispersion suitable for planetary observations. Very extensive work on the telescope pier, floor, and dome structure is required to permit moving the spectrograph even a few feet to a position in which necessary improvements can be effected. In the first quarter of this contract, we have undertaken only what might be called the external jobs, since it was impossible to undertake work on the interior of the spectrograph in time to be certain of having it back in operation for the important velocity quadrature of Mars in December 1964.

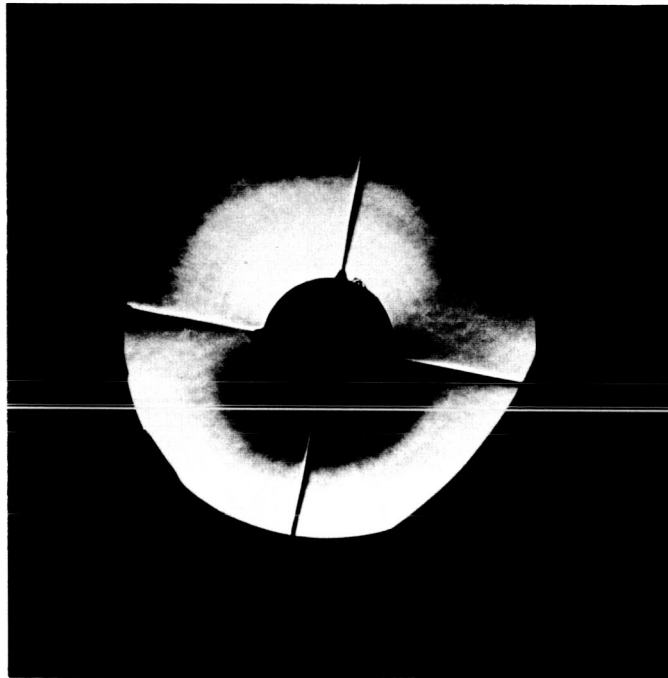
Since the contract was signed in July, the following specific steps have been taken:

1. Detailed drawings were made of the external modifications. These principally included cutting of hole and lowering of multiple I beams in dome floor, rebuilding and insulating ceiling of rooms below coude spectrograph, resealing with steel plate the new hole in the floor, welding extension rails onto existing rails supporting the coude spectrograph attached to the south pier of the 82-inch telescope, and design of a new multi-wall room to house the spectrograph.
2. The old steel and plaster room surrounding the spectrograph was torn down, and by contract with Metal Specialties of Odessa the above jobs (excluding the new housing) were satisfactorily completed.
3. Detailed designs were completed and a contract (also with Metal Specialties) let for construction of a catwalk around the inside of the dome of the 82-inch telescope to replace the present stair giving access to the prime focus pulpits; removal of this moving stair was mandatory before the coude spectrograph could be moved. Fabrication of the catwalk elements is complete; they are now in the process of being installed.
4. The two flat mirrors in the coude spectrograph train have been remounted to free them of possible astigmatic binding and each has been figured to within 1/35th wave of flatness (neither was as good as 1/10th wave initially); the coude secondary mirror of the telescope has been refigured to incorporate the small remaining errors of figure in the primary mirror, such that the combination now yields to the coude focus probably the best image produced by any large telescope

in the world today, its intrinsic performance approaching that of the diffraction limit. Seeing, of course, normally prevents one from having images even 1/10th this good, but on occasion this superb quality of the coude focus will make itself felt very much to the advantage of the McDonald Observatory programs in photography and spectroscopy of planets and other objects. This optical work was done on a consulting basis by Jean Texereau of the Paris Meudon Observatory, one of the world's finest astronomical opticians. Texereau also corrected serious errors of figure produced by improper design and construction of the cell being used for the coude mirror.

5. The optics within the coude spectrograph have been tested and found appropriate to the contemplated larger collimated beam to be built into the spectrograph, after the coming December velocity quadrature of Mars.
6. Orders have been placed for three new diffraction gratings larger than the present old tarnished one. This should markedly improve the efficiency, resolving power, and dispersion available with the spectrograph.
7. A complete set of drawings has been prepared of the coude spectrograph for the first time in its history, including photographs of critical parts. With the aid of these it has been possible to begin detailed design of the internal changes to be carried out after the December Mars run.
8. An observing program has been set up for the Mars velocity quadrature consisting of a 10-day session with H. Spinrad and R. Schorn as principal investigators.

Appended to this report are before-after prints indicating the nature of the optical work on the coude focus, two prints demonstrating the superlative quality now achieved by the optics of the coude focus, and four blue-prints showing the design changes in the spectrograph and building.

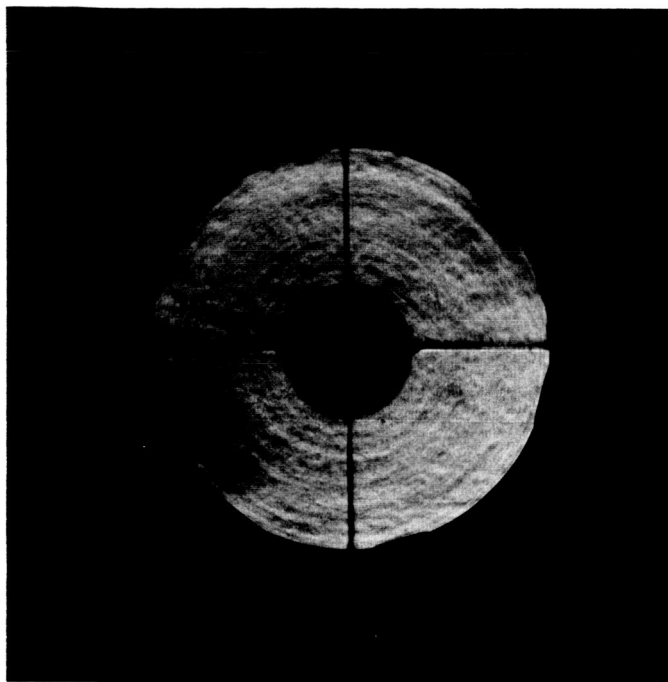


Foucaultgram showing condition of 82-inch coude
optics prior to optical work by Texereau

August 17, 1964

State No. 0

Overcorrection 3.1 λ



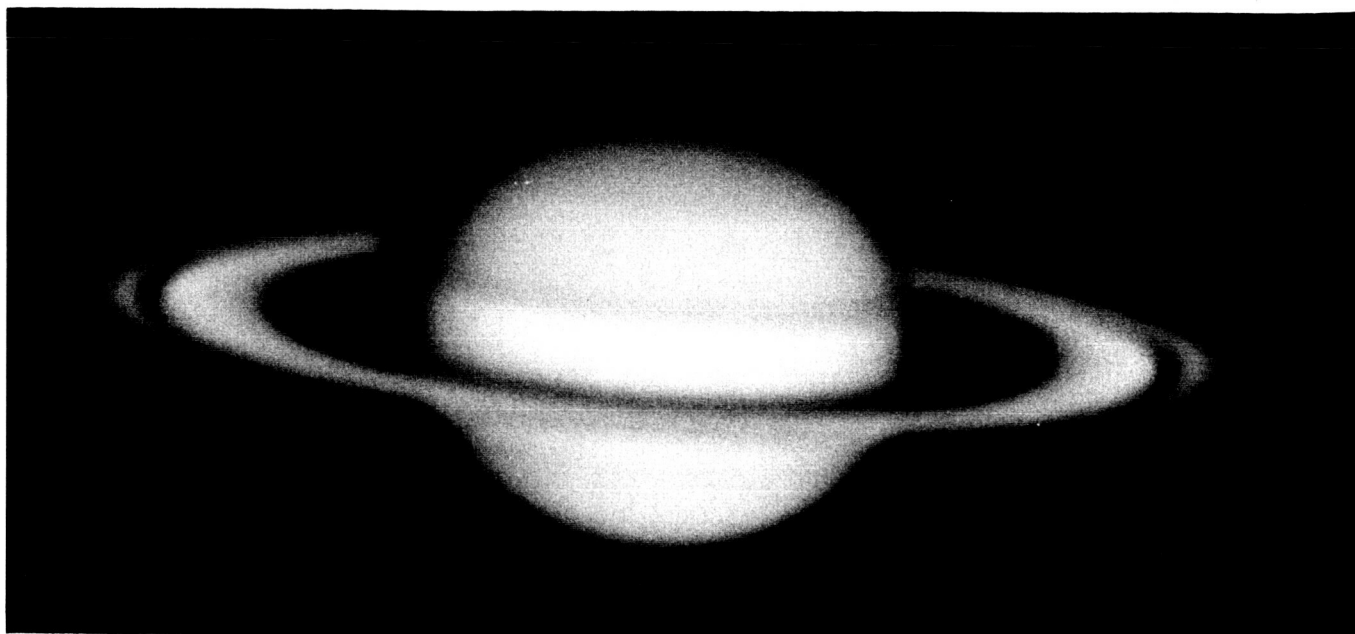
Foucaultgram showing condition of 82-inch coude
optics after final correction by Texereau

September 16, 1964

State No. 21

21^h59^m

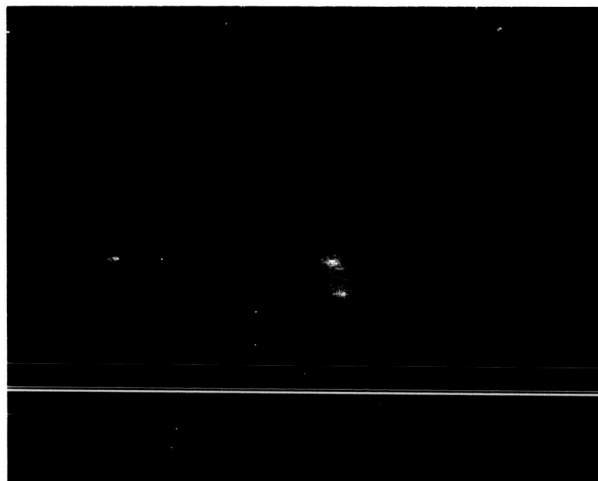
(Gray shadows on mirror arise from
air currents in tube)



Saturn September 29, 1964

82-inch Coude + Barlow lens

EFL: 153 meters x 4.9 enlargement of negative
Exposure: 1.5 sec. on Tri X



Double Star Σ 359; Separation $\rho = 0''.49$

82-inch Coude + Barlow lens

EFL: 153 meters x 12 enlargement of negative
Scale on this print: $1'' = 9 \text{ mm}$